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Kuhns

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(45) **Date of Patent: Jun. 26, 2012**

(54) **METHOD AND SYSTEM FOR TYPESETTING WITH MULTIPLE-COLOR CHARACTERS USING LAYER FONTS**

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(51) **Int. Cl.**
G09G 5/02 (2006.01)
G06F 17/20 (2006.01)

(52) **U.S. Cl.** **345/594**; 345/593; 715/269

(58) **Field of Classification Search** 345/593, 345/594; 715/269

See application file for complete search history.

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(57) **ABSTRACT**

One embodiment of a desktop publishing system including a typesetting software application, one or more families of layer fonts, and a layer font manager program. The layer font manager will automate the creation of copies of a text object selected within the typesetting application, and assign to those copies other fonts from the same layer font family as that of the original object. The layer font manager will additionally bind the original object together with the copies into a composite unit, keeping all copies precisely aligned. This embodiment will simplify the process of using layer fonts to set type with multiple-color characters.

2 Claims, 16 Drawing Sheets

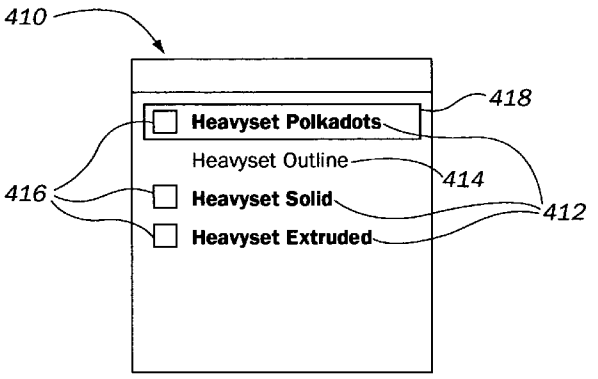


FIG. 1A

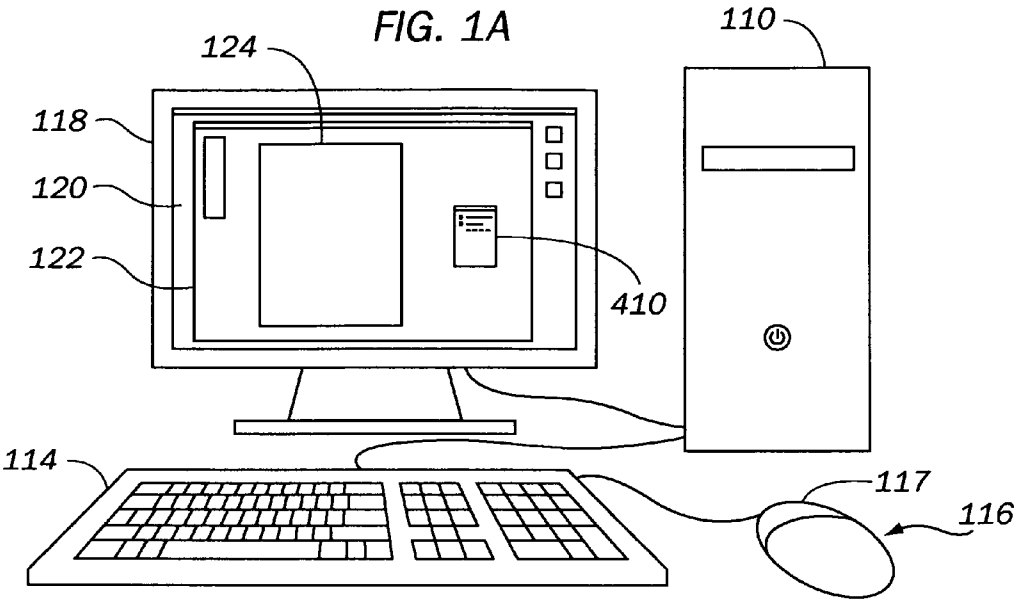

110
124
118
120
122
410
114
117
116

FIG. 1B

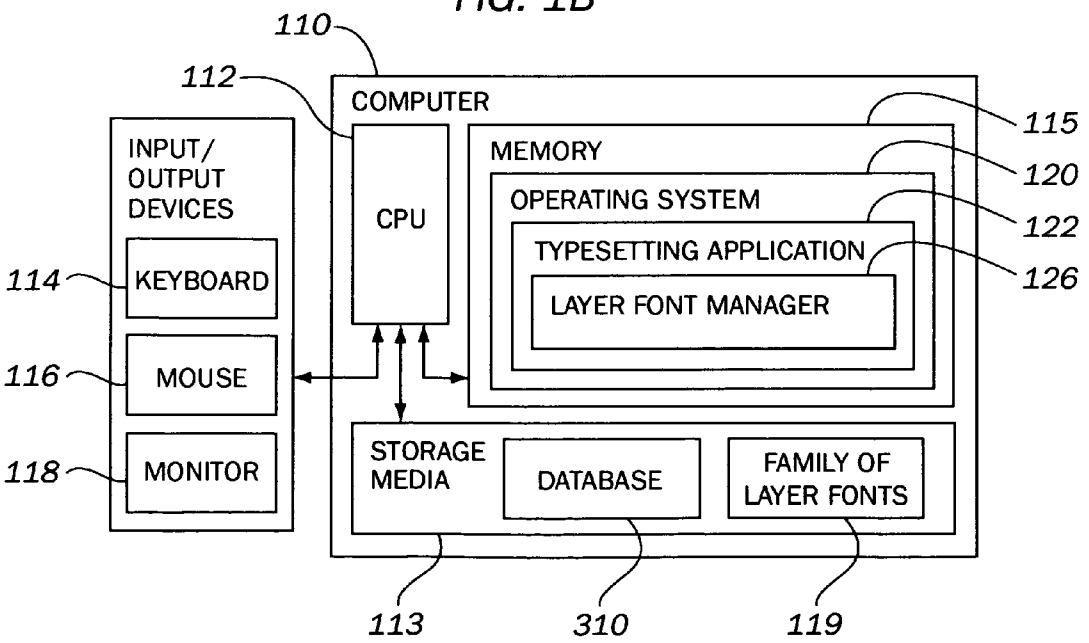
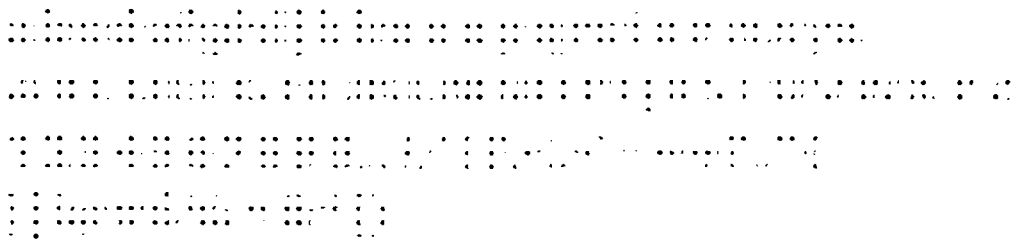
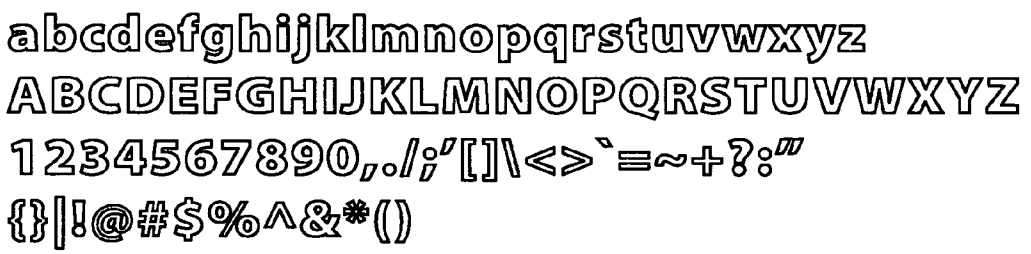

110
112
COMPUTER
115
INPUT/
OUTPUT
DEVICES
CPU
MEMORY
120
OPERATING SYSTEM
122
TYPESETTING APPLICATION
126
LAYER FONT MANAGER
114
KEYBOARD
116
MOUSE
118
MONITOR
STORAGE
MEDIA
DATABASE
FAMILY OF
LAYER FONTS
113
310
119

FIG. 2

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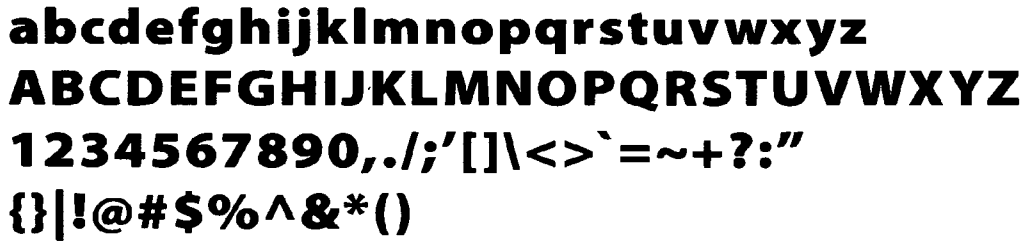
1234567890,./;'[]\<>`=~+?:"
{}|!@#$%^&*()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1234567890,./;'[]\<>`=~+?:"
{}|!@#$%^&*()

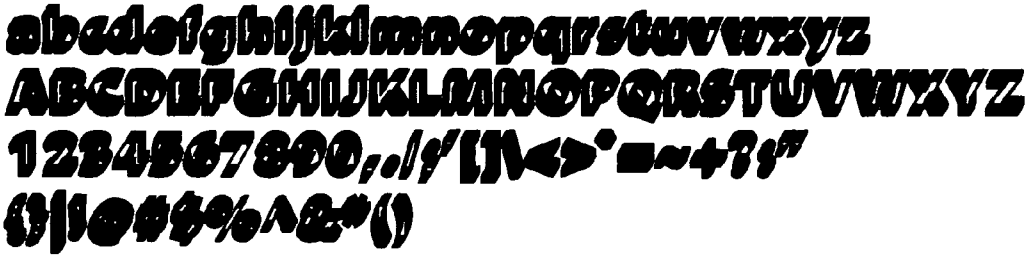


FIG. 3

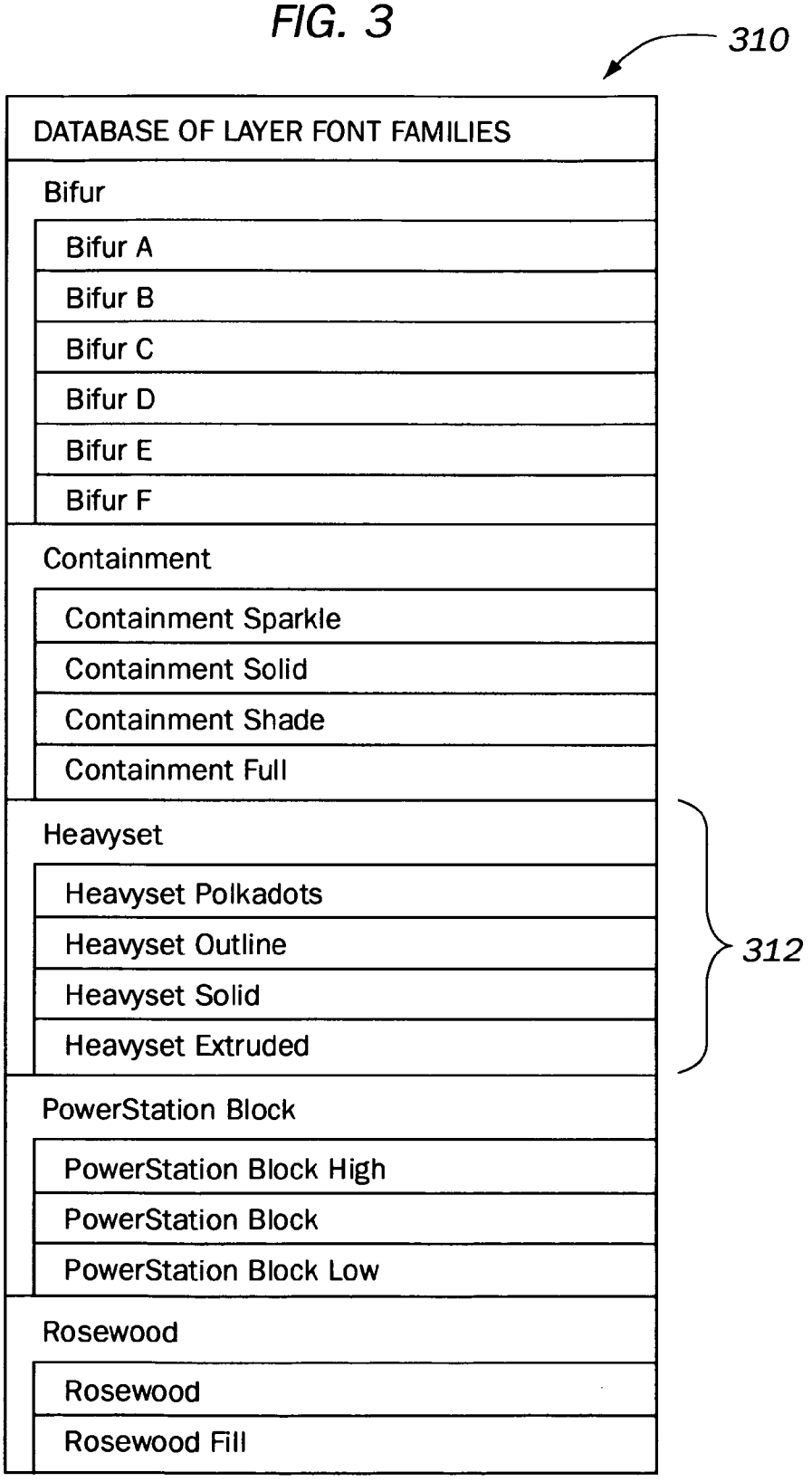

310
DATABASE OF LAYER FONT FAMILIES
Bifur
Bifur A
Bifur B
Bifur C
Bifur D
Bifur E
Bifur F
Containment
Containment Sparkle
Containment Solid
Containment Shade
Containment Full
Heavyset
Heavyset Polkadots
Heavyset Outline
Heavyset Solid
Heavyset Extruded
312
PowerStation Block
PowerStation Block High
PowerStation Block
PowerStation Block Low
Rosewood
Rosewood
Rosewood Fill

FIG. 4

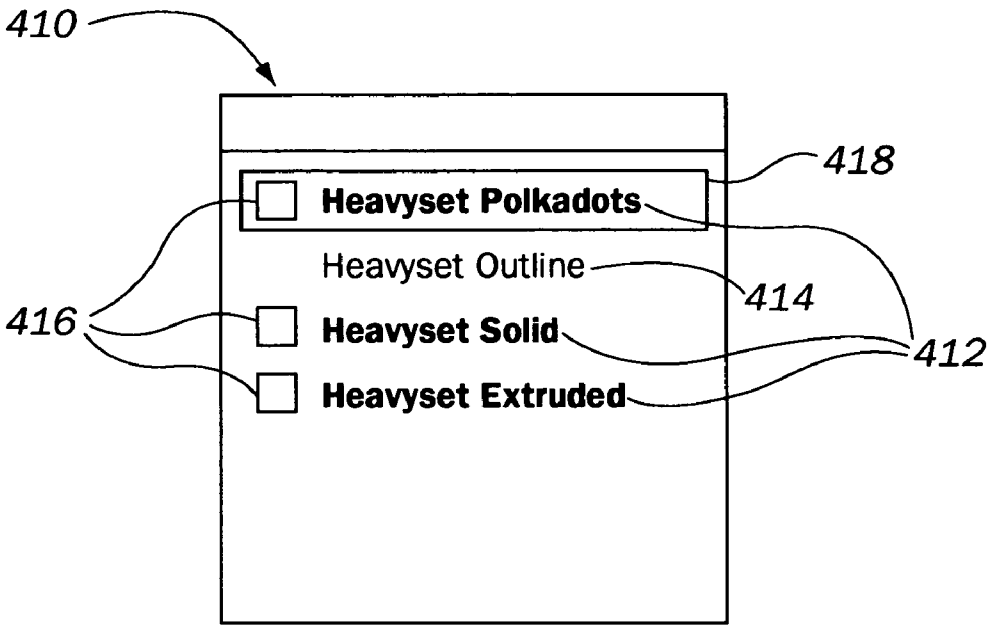

410
418
Heavyset Polkadots
Heavyset Outline
414
416
Heavyset Solid
412
Heavyset Extruded

FIG. 5

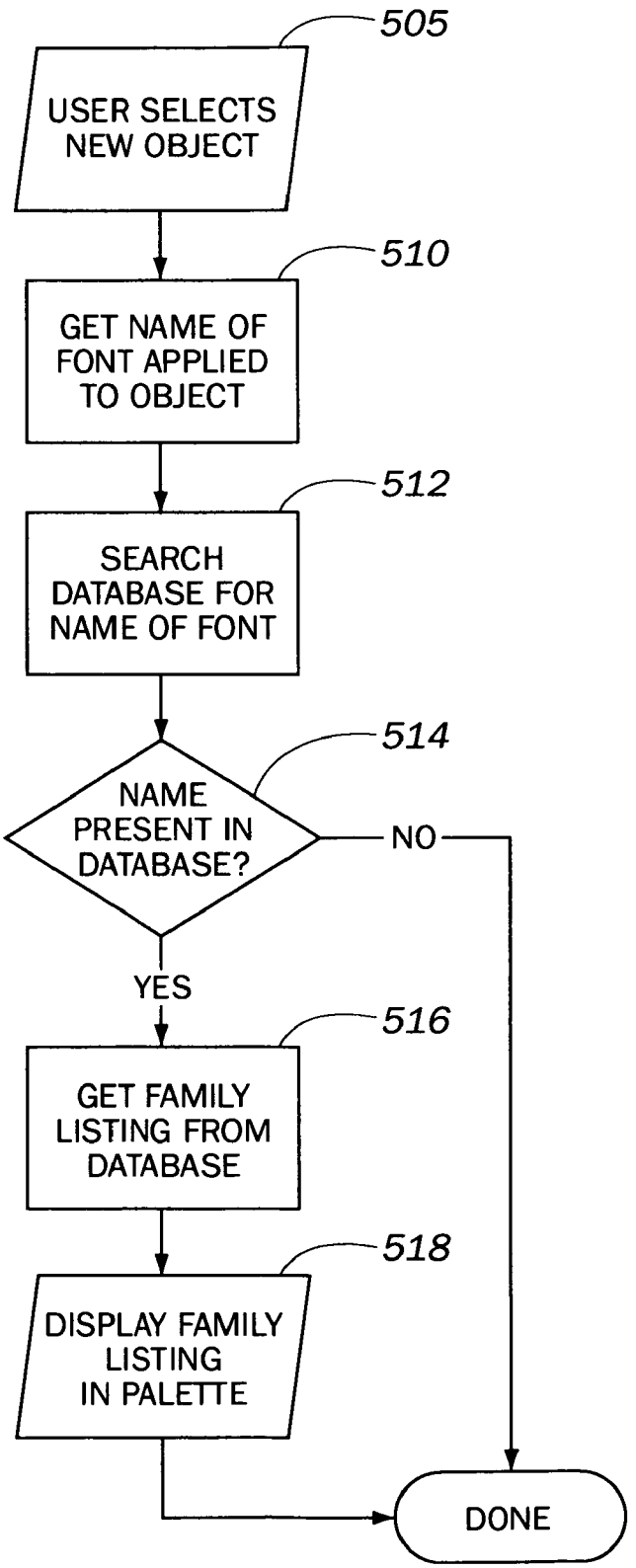

505
USER SELECTS NEW OBJECT
510
GET NAME OF FONT APPLIED TO OBJECT
512
SEARCH DATABASE FOR NAME OF FONT
514
NAME PRESENT IN DATABASE?
NO
YES
516
GET FAMILY LISTING FROM DATABASE
518
DISPLAY FAMILY LISTING IN PALETTE
DONE

FIG. 6

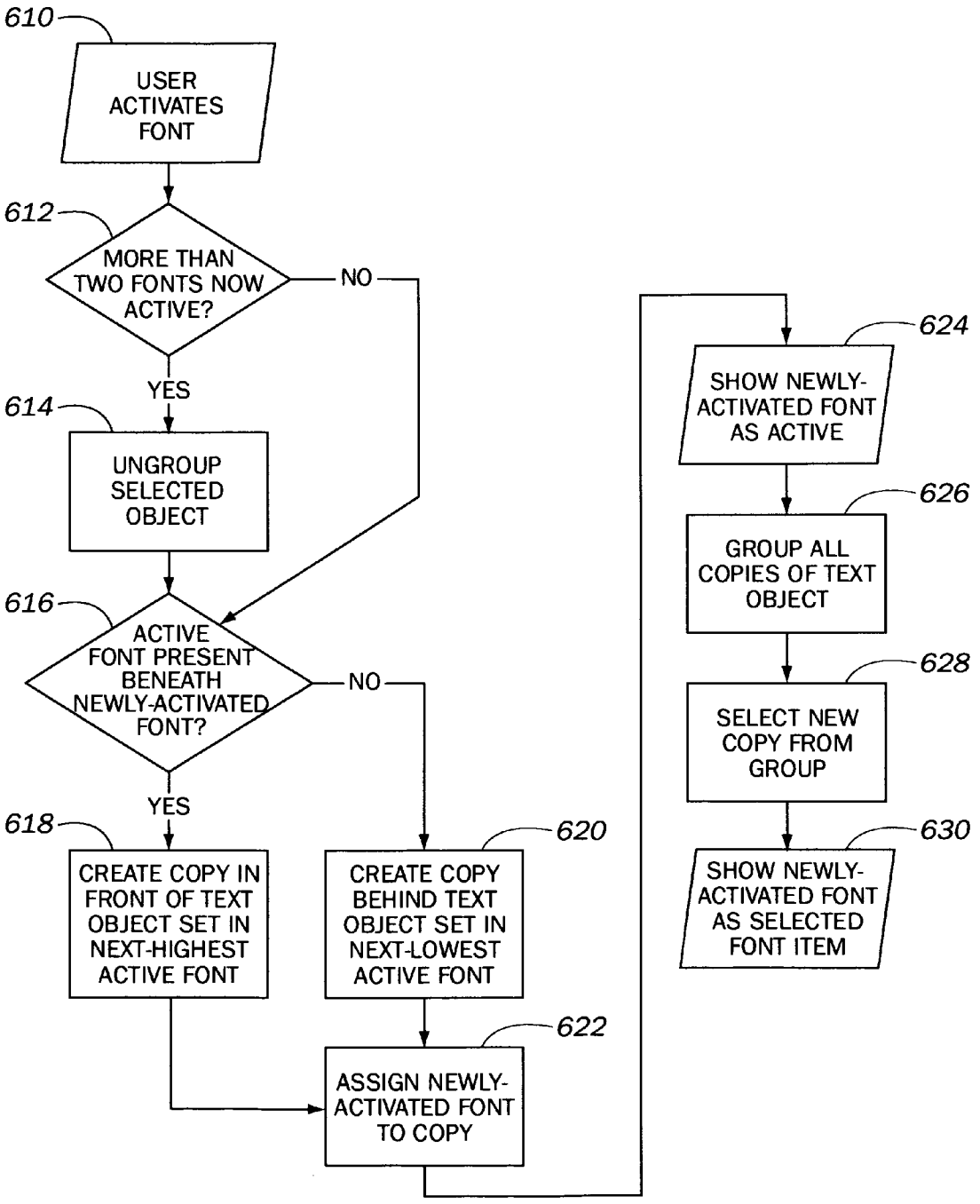

610
USER ACTIVATES FONT
612
MORE THAN TWO FONTS NOW ACTIVE?
NO
YES
614
UNGROUP SELECTED OBJECT
616
ACTIVE FONT PRESENT BENEATH NEWLY-ACTIVATED FONT?
NO
YES
618
CREATE COPY IN FRONT OF TEXT OBJECT SET IN NEXT-HIGHEST ACTIVE FONT
620
CREATE COPY BEHIND TEXT OBJECT SET IN NEXT-LOWEST ACTIVE FONT
622
ASSIGN NEWLY-ACTIVATED FONT TO COPY
624
SHOW NEWLY-ACTIVATED FONT AS ACTIVE
626
GROUP ALL COPIES OF TEXT OBJECT
628
SELECT NEW COPY FROM GROUP
630
SHOW NEWLY-ACTIVATED FONT AS SELECTED FONT ITEM

FIG. 7A

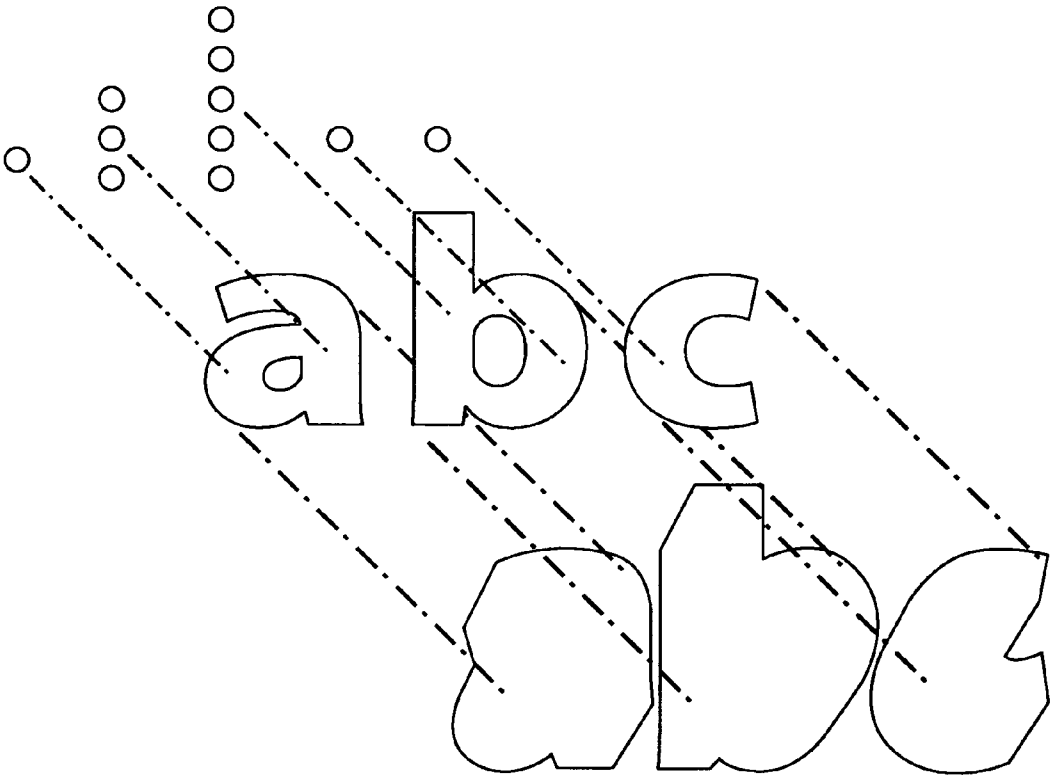


FIG. 7B

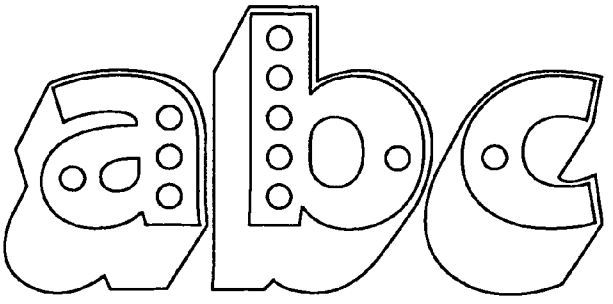


FIG. 8

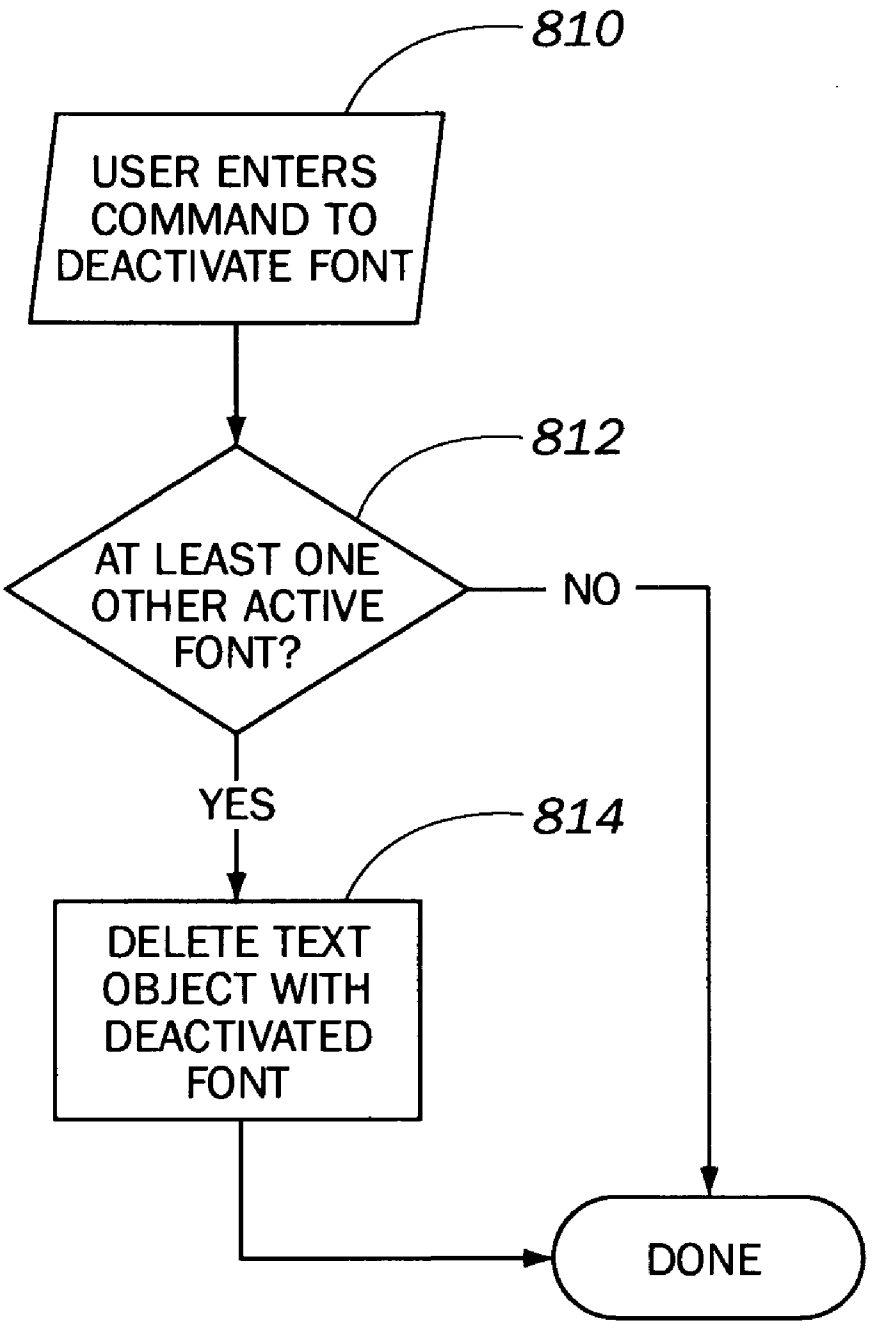

810
USER ENTERS COMMAND TO DEACTIVATE FONT
812
AT LEAST ONE OTHER ACTIVE FONT?
NO
YES
814
DELETE TEXT OBJECT WITH DEACTIVATED FONT
DONE

FIG. 9

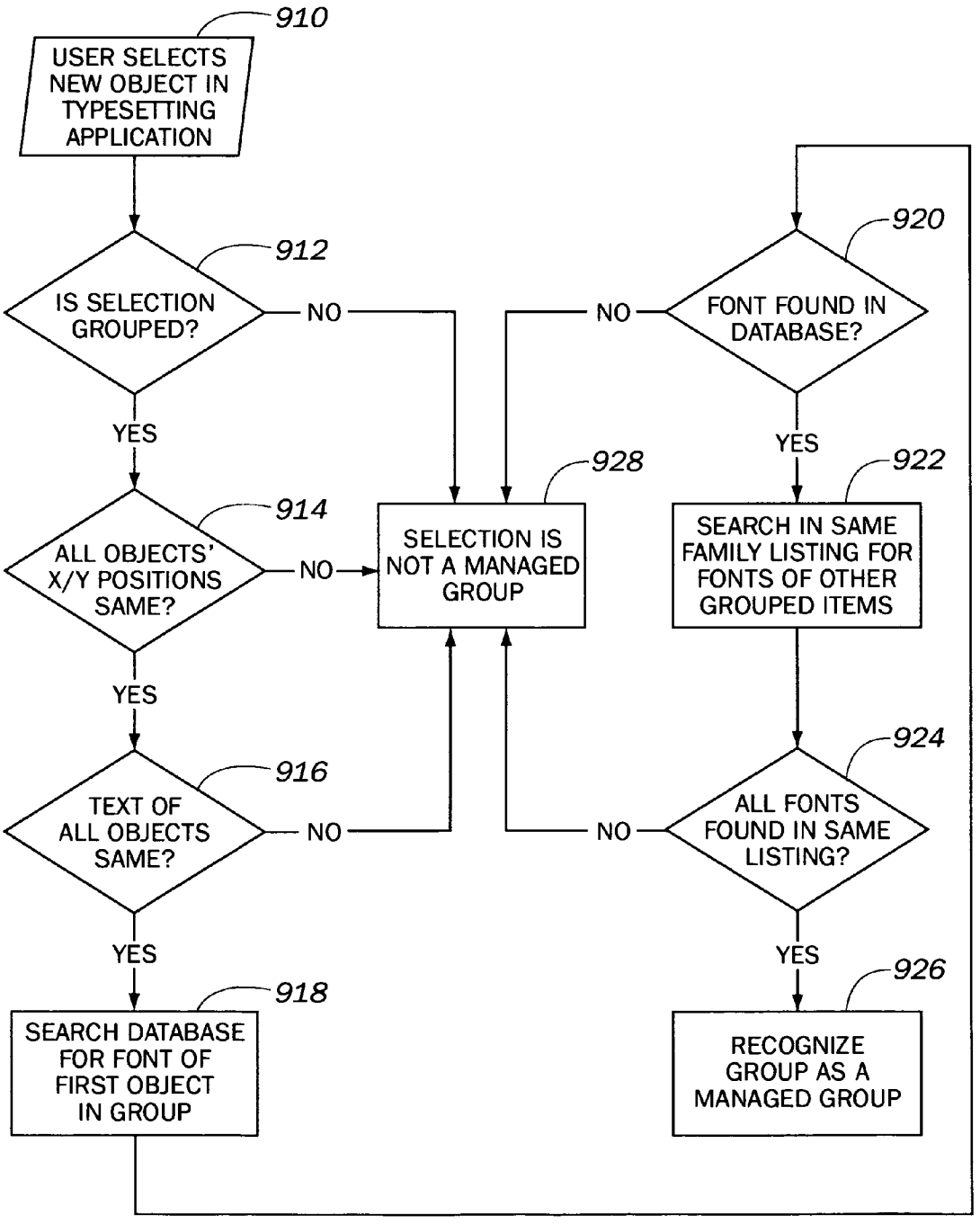

910
USER SELECTS NEW OBJECT IN TYPESETTING APPLICATION
912
IS SELECTION GROUPED?
NO
YES
914
ALL OBJECTS' X/Y POSITIONS SAME?
NO
YES
916
TEXT OF ALL OBJECTS SAME?
NO
YES
918
SEARCH DATABASE FOR FONT OF FIRST OBJECT IN GROUP
928
SELECTION IS NOT A MANAGED GROUP
920
FONT FOUND IN DATABASE?
NO
YES
922
SEARCH IN SAME FAMILY LISTING FOR FONTS OF OTHER GROUPED ITEMS
924
ALL FONTS FOUND IN SAME LISTING?
NO
YES
926
RECOGNIZE GROUP AS A MANAGED GROUP

FIG. 10

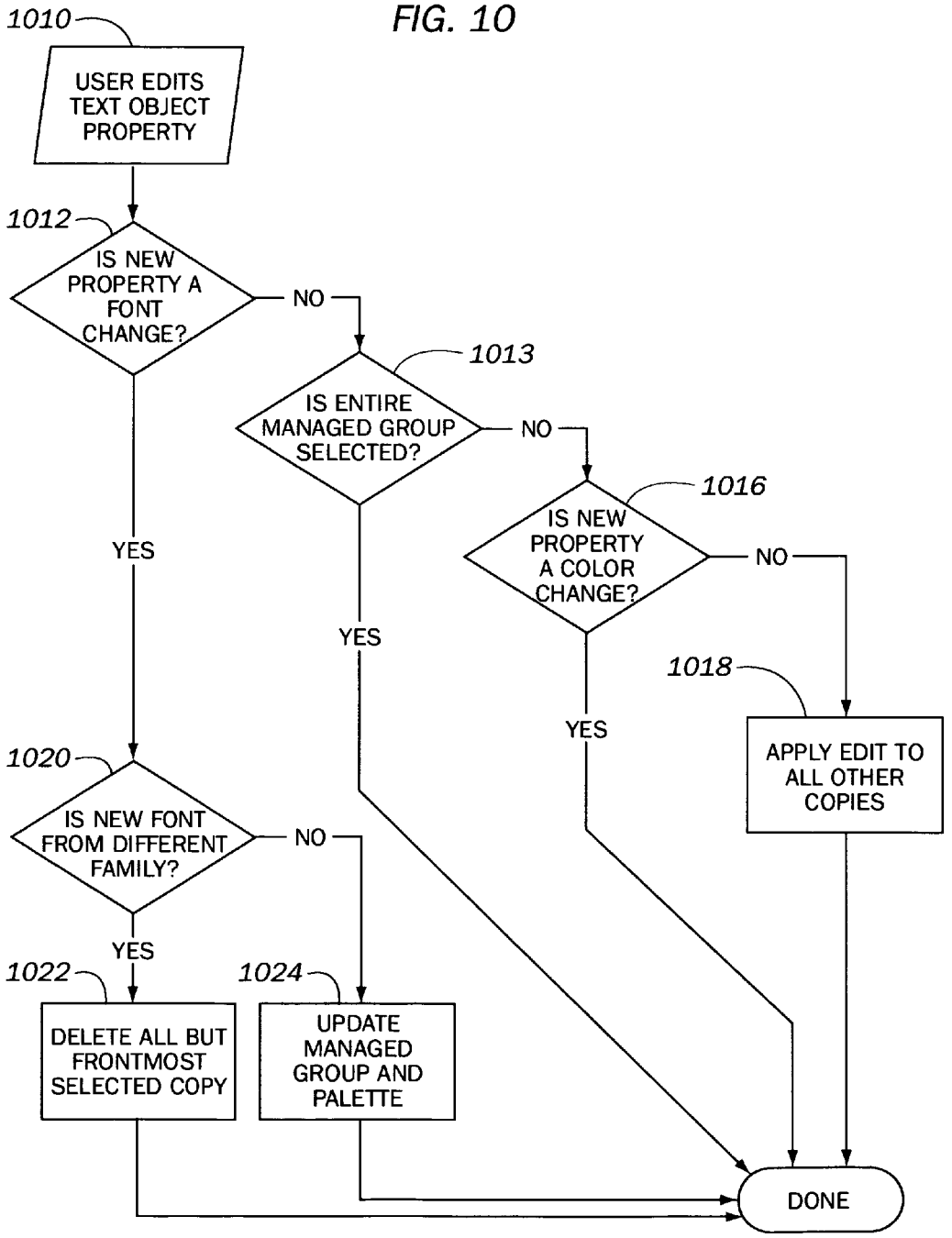

1010
USER EDITS TEXT OBJECT PROPERTY
1012
IS NEW PROPERTY A FONT CHANGE?
NO
1013
IS ENTIRE MANAGED GROUP SELECTED?
NO
1016
IS NEW PROPERTY A COLOR CHANGE?
NO
1018
APPLY EDIT TO ALL OTHER COPIES
YES
YES
YES
1020
IS NEW FONT FROM DIFFERENT FAMILY?
NO
YES
1022
DELETE ALL BUT FRONTMOST SELECTED COPY
1024
UPDATE MANAGED GROUP AND PALETTE
DONE

FIG. 11

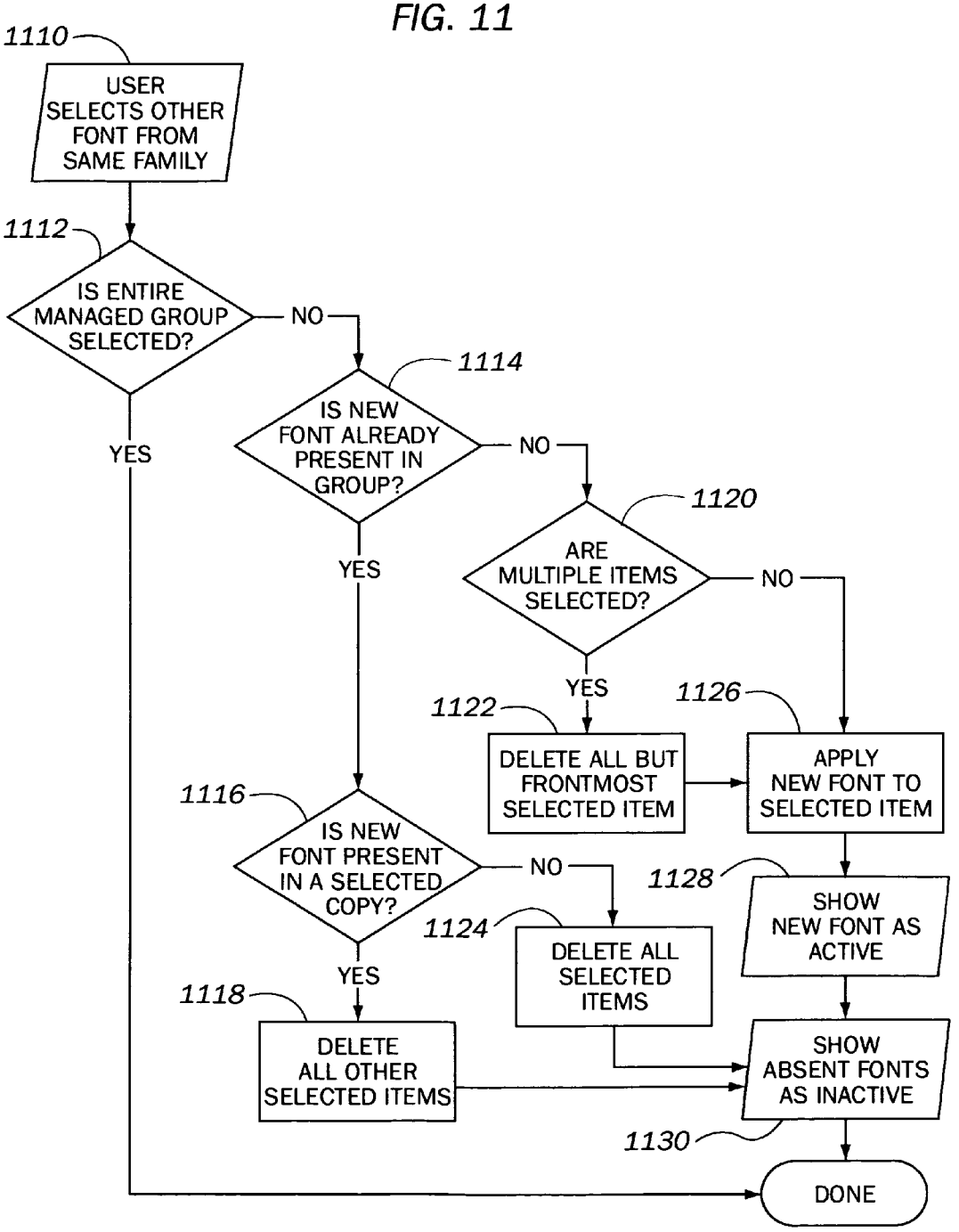

1110
USER SELECTS OTHER FONT FROM SAME FAMILY
1112
IS ENTIRE MANAGED GROUP SELECTED?
NO
YES
1114
IS NEW FONT ALREADY PRESENT IN GROUP?
NO
YES
1120
ARE MULTIPLE ITEMS SELECTED?
NO
YES
1122
DELETE ALL BUT FRONTMOST SELECTED ITEM
1126
APPLY NEW FONT TO SELECTED ITEM
1116
IS NEW FONT PRESENT IN A SELECTED COPY?
NO
YES
1124
DELETE ALL SELECTED ITEMS
1128
SHOW NEW FONT AS ACTIVE
1118
DELETE ALL OTHER SELECTED ITEMS
SHOW ABSENT FONTS AS INACTIVE
1130
DONE

FIG. 12

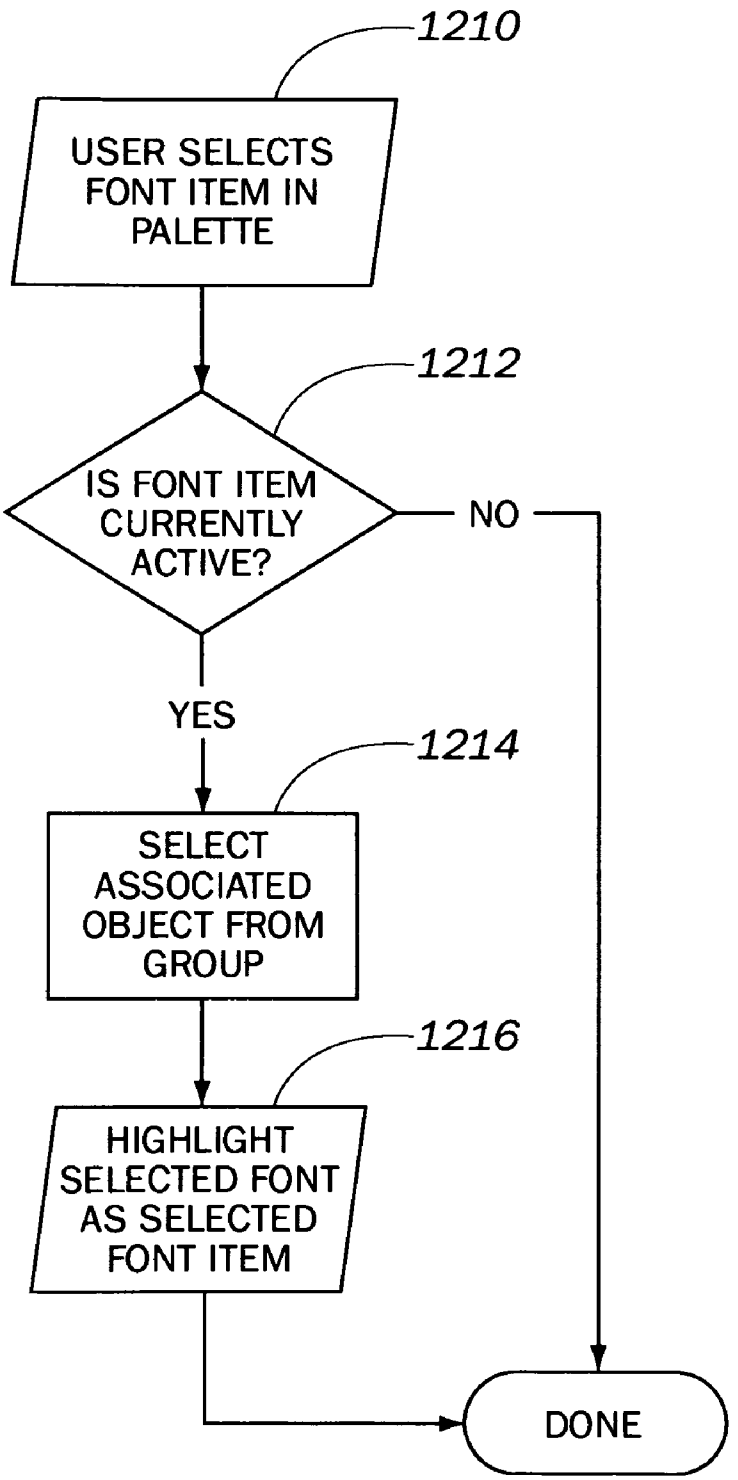

1210
USER SELECTS FONT ITEM IN PALETTE
1212
IS FONT ITEM CURRENTLY ACTIVE?
NO
YES
1214
SELECT ASSOCIATED OBJECT FROM GROUP
1216
HIGHLIGHT SELECTED FONT AS SELECTED FONT ITEM
DONE

FIG. 13

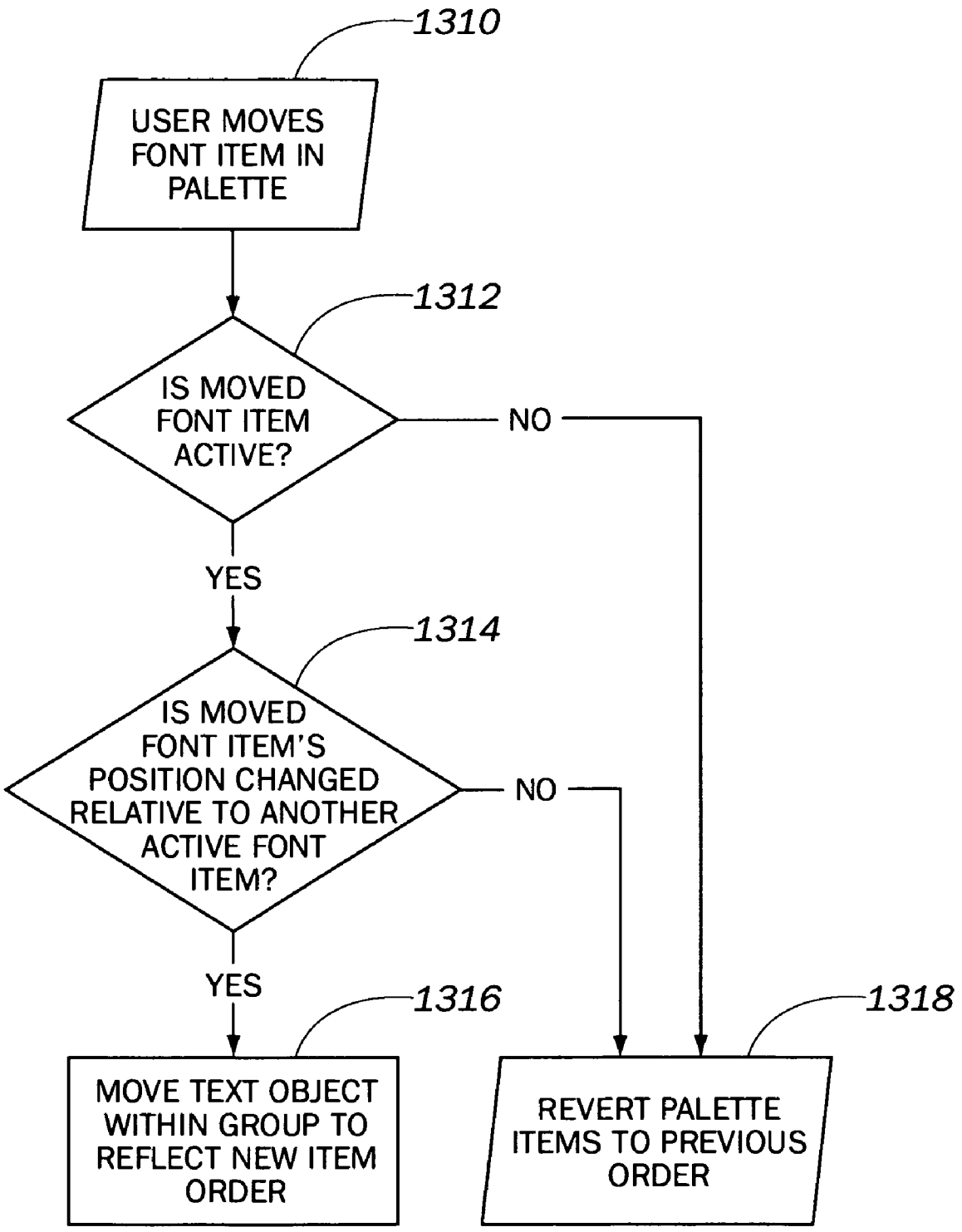

1310
USER MOVES FONT ITEM IN PALETTE
1312
IS MOVED FONT ITEM ACTIVE?
NO
YES
1314
IS MOVED FONT ITEM'S POSITION CHANGED RELATIVE TO ANOTHER ACTIVE FONT ITEM?
NO
YES
1316
MOVE TEXT OBJECT WITHIN GROUP TO REFLECT NEW ITEM ORDER
1318
REVERT PALETTE ITEMS TO PREVIOUS ORDER

FIG. 14

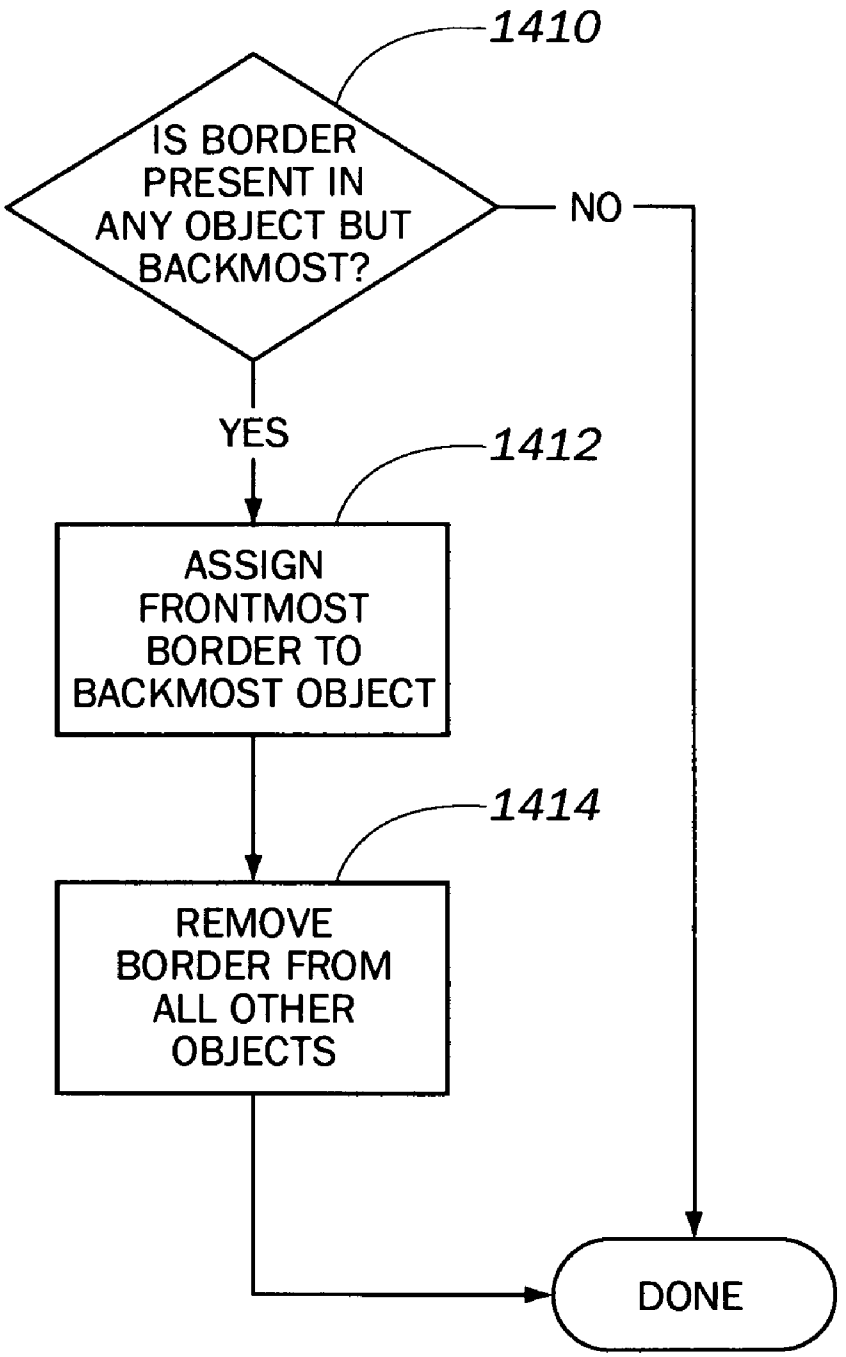

1410
IS BORDER PRESENT IN ANY OBJECT BUT BACKMOST?
NO
YES
1412
ASSIGN FRONTMOST BORDER TO BACKMOST OBJECT
1414
REMOVE BORDER FROM ALL OTHER OBJECTS
DONE

FIG. 15A

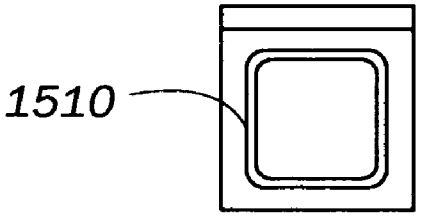


FIG. 15B

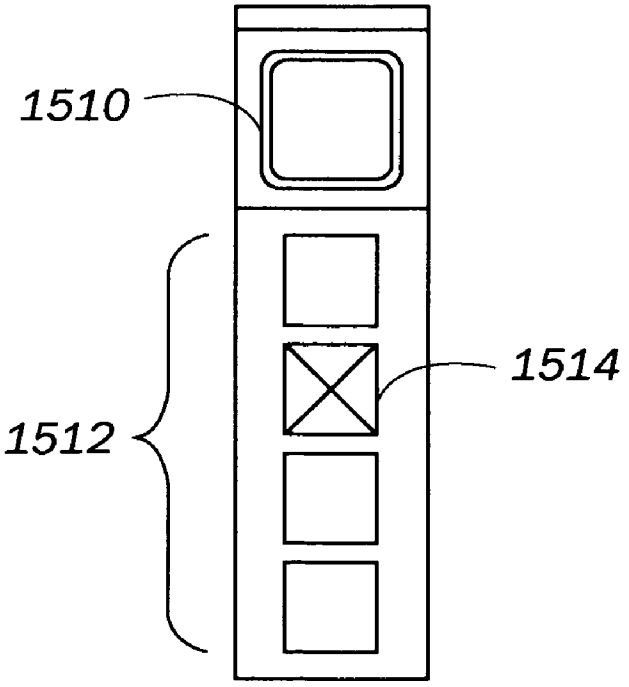
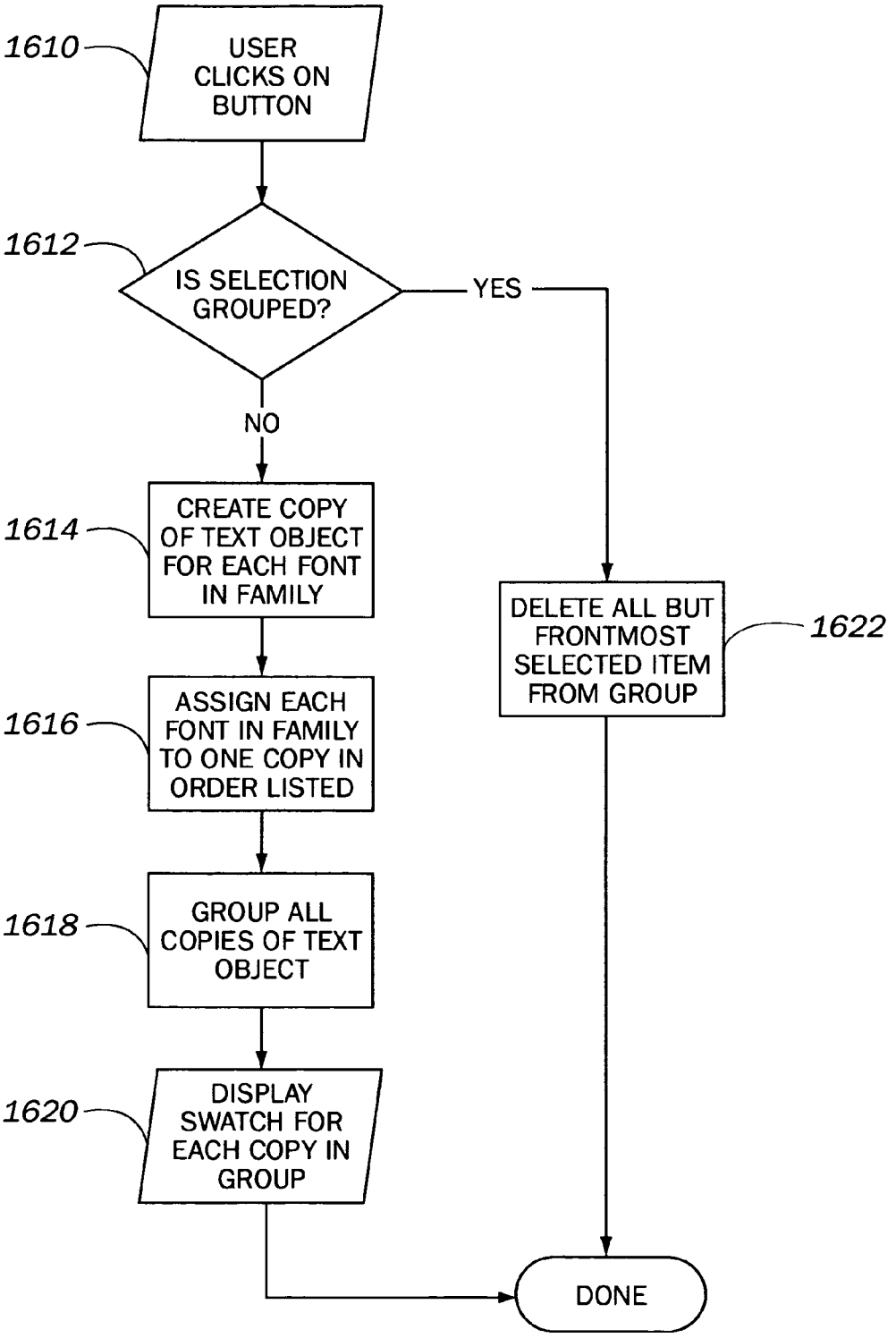


FIG. 16


1610
USER CLICKS ON BUTTON
1612
IS SELECTION GROUPED?
YES
NO
1614
CREATE COPY OF TEXT OBJECT FOR EACH FONT IN FAMILY
1616
ASSIGN EACH FONT IN FAMILY TO ONE COPY IN ORDER LISTED
1618
GROUP ALL COPIES OF TEXT OBJECT
1620
DISPLAY SWATCH FOR EACH COPY IN GROUP
1622
DELETE ALL BUT FRONTMOST SELECTED ITEM FROM GROUP
DONE

METHOD AND SYSTEM FOR TYPESETTING WITH MULTIPLE-COLOR CHARACTERS USING LAYER FONTS

CROSS-REFERENCE TO RELATED APPLICATIONS

Not Applicable

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not Applicable

REFERENCE TO SEQUENCE LISTING, A TABLE, OR A COMPUTER PROGRAM LISTING COMPACT DISC APPENDIX

Not Applicable

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to computer typesetting and, more particularly, to the use and management of layer fonts in rendering glyphs with multiple colors.

2. Prior Art

The shapes of written language, at their most basic, are formed of simple strokes or dots. Therefore, characters (letters, numbers, punctuation, etc.) may be adequately represented by glyphs (shapes) of a single color for utilitarian purposes.

Nevertheless, the use of decorative lettering with multiple colors in individual glyphs is a long-established tradition. Such lettering is present in some of the earliest preserved examples of calligraphy. By the 19th century, printers employed "chromatic type" to produce multiple-color lettering; different versions of one character were printed on the same space, using different inks, creating a single composite character of multiple colors.

In the modern era, multiple-color lettering is frequently employed in both printed and electronic media, particularly for consumer-targeted graphics such as signs, packaging and advertising. Most of this lettering, however, must be custom-produced for each new design, because of the monochrome paradigm which generally prevails in computer typesetting.

Computer Typesetting

Typesetting—the process of arranging and styling text for publication—is today mostly carried out with the use of desktop publishing systems. A typical desktop publishing system includes a personal computer and specialized typesetting software. Operating system software installed on the computer, such as Mac OS X™ or Windows Vista™, provides an environment in which a user may install and run more-specialized software. Professional typesetting software may take the form of drawing applications, such as Adobe Illustrators, or page layout applications such as Adobe InDesign™ or Quark XPress™.

Desktop publishing systems are widely used by design professionals and others to compose documents with a variety of layouts, typefaces, and typographic effects, and to publish those documents to various printed-output devices or in electronic formats.

Most computer software, including typesetting application software, relies on font files for rendering text. A font file is an electronic document storing descriptions of a set of glyphs; a single font includes glyphs for a complete set of standard characters in one type style. Widely recognized fonts include Times Roman, Times Italic, Times Bold and Times Bold Italic, each of which is a distinct font. Some font files may combine a family of multiple related fonts, such as the varieties of Times, into a single file.

Computer fonts are produced by type designers, using special-purpose software applications, such as FontLab Studio, Fontographer, or FontForge. Type designers' studios are often referred to as foundries, in a legacy of the metal type of the pre-digital era.

Computer Font Formats

Broadly speaking, font files may be classified as bitmap fonts, scalable fonts, or a combination of the two. Bitmap fonts describe glyphs as patterns of pixels, or individual squares, within a grid. Bitmap fonts are mainly employed for display on electronic screens at a fixed size.

Scalable fonts use mathematical formulas to describe the lines and curves of a glyph. Scalable fonts may be enlarged to any size without losing sharp edges or smooth curves. For this reason, design and printing professionals rely almost exclusively on scalable fonts for printed text. Examples of commonly-encountered scalable font formats include Apple TrueType, Type 1, and OpenType™.

Nearly all of those font formats which are widely supported by desktop publishing software describe characters as single-color glyphs. Each individual glyph, whether described by bitmaps or mathematical formulas, is a solid shape which software applications use like a rubber stamp. Thus, characters may be assigned any of a variety of colors, but each individual character is always rendered with a single, solid color.

A few graphics software applications are capable of providing simple enhancements to the monochrome glyphs of standard fonts. Adobe Illustrator™, for example, can "fill" characters with smooth gradations between multiple colors, or with multiple-color patterns. Adobe Illustrator™ and select other applications can also render scalable font characters with an outline, distinct in color from the character's interior.

Generally speaking, however, the "rubber stamp" model prevails for all font formats commonly used in desktop publishing. This limits the use of multiple-color lettering to either simple effects (e.g. gradients, outlines), or else custom lettering designs which are laborious and time-consuming to create.

Alternative Font Formats

Various alternative font formats, introduced or proposed over the years, have supported multiple-color glyphs. As will be seen, however, all such alternative formats possess significant drawbacks.

The Photofont™ format developed by Fontlab Ltd., Inc., for example, supports glyphs with multiple colors. However, in addition to requiring the installation of special software, which is only compatible with a small number of applications, Photofonts are bitmap fonts. This generally restricts their usefulness to electronic display at a specific, small, size. Photofonts are also limited to specific color combinations inherent in the design of the glyphs, preventing their adaptation to other color schemes.

The same limitations of predetermined colors and non-scalable bitmap glyphs also apply to the Bitmap Distribution Format (BDF) developed by Adobe Systems Inc., and to the format described in U.S. Pat. No. 6,762,770 (2004) "Method and System for Representation of Color and Other Attributes in Bitmap Fonts", issued to Beaman and Opstad.

The Type 3 specification developed by Adobe Systems Inc., while permitting scalable multiple-color glyphs, shares

the Photofont™ format's limitation of predetermined color combinations. The Type 3 format is also unsupported by currently-available desktop publishing software, making it impractical for most users and discouraging type foundries from developing new Type 3 fonts.

Another format for a multiple-color font is described in U.S. Pat. No. 6,057,858 (2000) "Multiple Media Fonts", issued to Desrosirers. This format, like that described in U.S. Pat. No. 6,091,505 (2000) "Method and System for Achieving Enhanced Glyphs in a Font", issued to Beaman and Opstad, describes a font format which would permit scalable letters with areas of distinct color in individual glyphs. These formats would also provide the option for an end user to determine the specific values assigned to a glyph's color variables.

No products employing these formats have been made available, however. Adoption of any new multiple-color, scalable font formats, including those of the aforementioned patents, will furthermore be hindered by substantial obstacles.

To be useful, a new font format will require type foundries to create, and users to purchase, new font files. A new font format will also require development of updates to both computer typesetting software and to the font authoring software used by type designers. Designers and developers face a "chicken-and-egg" dilemma, as the return on creating either new fonts or new software is uncertain, without the other first being in widespread use.

Further, whereas the OpenType™ format has achieved broad support since its introduction in 1997, it still defines glyphs as traditional monochrome shapes. A new scalable font format with support for multiple-color glyphs would introduce a feature unsupported by any current desktop publishing software. Therefore, such a format would likely require much more extensive effort to ensure compatibility with the software and hardware components of desktop publishing systems.

Layer Fonts

Type designers, thus largely limited to monochrome font formats, have nevertheless attempted to develop multiple-color typefaces using an alternative approach. In place of single multiple-color fonts, type designers have released families of "layer fonts" (sometimes referred to as chromatic, bicolor or multiple layer fonts). Examples of layer font families include Adobe Systems Inc's Rosewood™, International House of Fonts' Bifur, and astype's Sattler™.

Layer font families consist of multiple individual fonts, each of which contains the shapes for one distinct color variable. Used in concert, fonts from such a family simulate a composite multiple-color typeface.

Layer fonts rely on an end user, who must manually assemble the component color variables into composite multiple-color type. Many type foundries include illustrated instructions with layer fonts; usually, these instructions guide the user through one of two processes.

In the first process, the user must assign a font to one line of text, then copy that text, paste it directly atop the original, and assign to the new copy another font from the relevant family. The user must then repeat the process for each color variable included in the family.

In the second process, the user must enter a single character multiple consecutive times, then assign a different font to each instance of the character, and adjust spacing (kerning) between the letters so that characters overlap.

Limitations of Layer Fonts

Both of these methods have several drawbacks. They are nonintuitive, involving many extra steps not normally performed in computer typesetting. Creating multiple-color text by these methods is also labor-intensive, as is editing such text, since both processes result in objects which are difficult to work with; by relying on characters stacked directly atop one another, these methods make most components of the composite type difficult to access. This in turn hinders experimentation with different color combinations.

Existing attempts to solve the problems of layer fonts have been largely unsuccessful. The instructions provided by foundries such as Alphabet Soup, though helpful in explaining the primary methods for working with layer fonts, do not make the actual processes any simpler or more efficient.

The type foundry underware has introduced fonts (e.g. Sauna Dingbats) with built-in kerning values, partially automating the steps of overlaying each color component used in the second process, but this approach also leaves many problems unresolved.

Once characters are made to overlap by the second process, it is difficult to select one of them, without first separating them by restoring neutral keming values. Performing this additional step (and reversing it, afterwards) significantly complicates changes to text, color and font layering order. Further, because this process still requires that a font be applied to nonconsecutive characters, changing the color value assigned to one fonts glyphs throughout an entire text would be slow and cumbersome. The user would need to select multiple individual characters throughout the text, then change the color of each, one by one.

BRIEF SUMMARY OF THE INVENTION

These and other drawbacks of the prior art are overcome, and additional advantages achieved, by a machine for setting type with multiple-color characters. The machine will include a personal computer, a typesetting application, at least one family of layer fonts, a database of layer font names organized by family, and a program for managing layer fonts.

The machine will facilitate the assembly and use of composite multiple-color type, using layer fonts. The composite type will be formed of multiple, single-color text objects stacked atop one another. Each object, set in a different font from a single layer font family, will contribute the shapes which comprise one color variable.

When a text object is selected within the typesetting application, and is set in a font named in the database of layer fonts, the layer font manager will display a palette listing all fonts in the relevant layer font's family. A user may then activate another font listed in the palette, prompting the layer font manager to create a new object, copied from the selected text but set in the activated font. The layer font manager will assemble the copy and the original text into a composite, managed group.

When such a group is selected, the palette will indicate which fonts are represented in the group, as well as display the text color of each object next to that object's respective font.

The layer font manager will maintain consistency in the text and typographic settings, excepting font or color, of all text objects within a managed group.

By selecting one active font from the palette list while working with a managed group, the user will prompt the layer font manager to select only the text assigned that font. By this means the user will be able to select, and then assign different color values to, any part of a composite text regardless of where the component text object is within the group. The layer font manager will also permit the user to reorder items within a managed group, by moving the respective font names within the palette.

The layer font manager will, additionally, keep decorative properties which may be assigned to a text object, such as backgrounds or borders, applied to a single object at the bottom of a managed group, regardless of how items may be added to, deleted from, or reordered within the group.

The machine will, through these features, provide a system for setting and managing multiple-color type which is intuitive, user-friendly and efficient, and which furthermore preserves compatibility with existing layer fonts and other software.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

FIG. **1**A shows, in pictorial form, a desktop publishing system which forms part of an apparatus for setting type with individual characters of more than one color.

FIG. **1**B is a block diagram illustrating an apparatus for setting type with individual characters of more than one color.

FIG. **2** illustrates, in pictorial form, a family of layer fonts intended for the creation of composite type with multiple-color characters.

FIG. **3** is a diagram illustrating listings within a database of layer fonts organized by font family.

FIG. **4** is a user interface for displaying information about, and manipulating, text objects set in layer fonts intended for the creation of composite type with multiple-color characters.

FIG. **5** is a flow diagram illustrating a process of determining when to display a listing of all fonts from the family of a currently selected font.

FIG. **6** is a flow diagram illustrating a process of creating a copy of a text object, and assigning to it a related font, for the purpose of creating or adding to a unit of composite type with multiple-color characters.

FIG. **7**A illustrates, in pictorial form, objects forming a unit of composite type with multiple-color characters, in exploded view.

FIG. **7**B illustrates, in pictorial form, objects forming a unit of composite type with multiple-color characters, as normally seen by a user.

FIG. **8** is a flow diagram illustrating a process of deleting a text object from a unit of composite type with multiple-color characters.

FIG. **9** is a flow diagram illustrating a process of recognizing a unit of composite type with multiple-color characters.

FIG. **10** is a flow diagram illustrating a process of maintaining consistent text and typographic settings among components of a unit of composite type with multiple-color characters.

FIG. **11** is a flow diagram illustrating a process of revising a unit of composite type with multiple-color characters when different fonts, from within the font family used in the composite type, are applied to part or all of the composite unit.

FIG. **12** is a flow diagram illustrating a process of selecting a specific text object from a unit of composite type based upon user input.

FIG. **13** is a flow diagram illustrating a process of determining whether or not to reorder text objects within a unit of composite type with multiple-color characters.

FIG. **14** is a flow diagram illustrating a process of managing a decorative border property within a unit of composite type with multiple-color characters.

FIG. **15**A is a user interface permitting the automated assembly of composite type with multiple-color characters, using multiple text objects.

FIG. **15**B is an expanded user interface for displaying information about, and manipulating, text objects set in layer fonts intended for the creation of composite type with multiple-color characters.

FIG. **16** is a flow diagram illustrating a process of automatically assembling, or disassembling, a unit of composite type with multiple-color characters.

GLOSSARY

(Adapted from http://www.linotype.com/47/fontglossary.html and other sources)

Alphabet: All letters of a language. The English language alphabet has 26 letters.

Bitmap: A pattern of elements (e.g. pixels on a computer screen) which make up a character, graphic element, or image.

Character: The smallest component of a written language which has semantic value. A character is the abstract idea of the letter, numeral, symbol, etc.; a glyph is the specific shape, the form that you see on the page, screen, etc.

Chromatic type: Decorative metal or wood type from the second half of the 19th century. According to Ringwalt's *American Encyclopedia of Printing and Bookbinding* (1871): "type made of metal or wood for color printing and so arranged that there are duplicate or triplicate copies of each letter, which, after being printed, respectively, in different colors, on a given space, blend together in a harmonious whole"

Font: Traditionally, a complete set of characters for one typeface at one particular type size. In the following specification used, per familiar contemporary usage, as a synonym for "type style"

Font File: The technical transfer of a type style into a digital file, including the character set and the digital instructions contained in the font, such as the kerning values, hinting information, and type style name as well as other control information.

Font Family: Variants of different type styles, collectively combined under ajoint family name. With a font family, individual type styles may vary in stroke width (e.g., Helvetica Roman, Bold, Black), slope (e.g., Helvetica Italic), width (e.g., Helvetica Condensed, Extended) embellishment (e.g., Helvetica Rounded), etc., yet have some underlying common design form that allows for a harmonious appearance when the type styles are used together.

Glyph: The shape of a written character. For example, a roman 'a', an italic 'a' and a small caps 'A' are three different glyphs representing the same character.

Kerning: Manual or automatic regulation of the spacing between two adjacent characters in a text, in order to improve letter fit. Traditionally, kerning characters were those which overhung their own width: in many typefaces, the Roman "f" has a kern to the right, the Roman "j" a kern to the left.

Layer Font: A type style designed for use with one or more other type styles from the same family to create text with individual characters which contain multiple colors. Layer fonts are effectively an electronic successor to Chromatic type. Each type style in a layer font family provides the shapes for one color variable; duplicate copies of a text, each set in a different type style from the layer font family and assigned a unique color, are overlaid directly atop one another to create composite multiple color text.

Pixel: Acronym for picture element. The smallest element in a raster image which can be turned on (printed) or off (not

printed) to form an image (or bitmap) on a display screen or by any other form of digital output device.

Plug-in: A (usually small) piece of software which adds features to or enhances a larger piece of software. Plug-in architecture is employed so that a small piece of software may be loaded into memory by a larger program, adding a specific feature; users need only install the few plug-ins that they need out of a much larger pool of possibilities.

Resolution: Number of points or pixels per unit, usually measured in dpi (dots per inch) or P/cm (points per centimeter).

Scalable Font: A font which is defined mathematically and can be rendered at any size.

Type Style: One version of a font family, e.g. Helvetica Roman or Helvetica Bold is a type style.

Typography: The arts and sciences related to type: type design, typesetting, printing, kerning, and otherwise communicating with type.

DETAILED DESCRIPTION OF THE INVENTION

One embodiment of the present invention relates to computer typesetting and, more particularly, to the use and management of layer fonts in rendering glyphs with multiple colors. The following description is presented to enable one of ordinary skill in the art to make and use the related embodiment, and is provided in the context of a patent application and its requirements. Various modifications to the embodiment, and the generic principles and features described herein, will be readily apparent to those skilled in the art.

Components

One embodiment of the present invention consists of five main components: a personal computer **110**, a typesetting software application **122**, at least one family of layer fonts **119**, a record of layer font families in an electronic database **310**, and a layer font manager program **126**.

The personal computer **110** will be any system such as those sold by Apple, Inc., of Cupertino, Calif., or Hewlett-Packard, of Palo Alto, Calif. As illustrated in FIG. **1**A and FIG. **1**B, the personal computer **110** will include a central processing unit **112**, memory **115** and storage media **113**, as well as a keyboard **114** and mouse **116** for input, and a monitor **118** for output. Operating system software **120**, installed on the computer, will manage other software and present a user with a graphical user interface via the monitor **118**. Examples of operating system software include Mac OS X™, sold by Apple, Inc., and Windows Vista™, sold by Microsoft Corporation of Redmond, Wash.

The typesetting application **122** will be a program that can be installed and run within the operating system environment. Examples of typesetting applications include Adobe InDesign™, sold by Adobe Systems Inc. of San Jose, Calif., and Quark XPress™, sold by Quark, Inc. of Denver, Colo.

The typesetting application **122** will permit the creation of virtual documents which may be published to printed-output devices or in electronic formats. The typesetting application **122** will permit the user to create and manipulate objects, including text and graphic elements, within such a document **124**. Text objects may take the form of single lines of text, or of blocks of text which flow onto multiple lines within the borders of a rectangular box or other shape.

Within a typesetting application document **124**, every object will exist on a distinct layer. Objects on "higher" layers will conceal those on "lower" layers if sharing the same coordinates on the document's X (horizontal) and Y (vertical) axes. The typesetting application **122** will include the option to group two or more objects, such that selecting any object which is part of the group will automatically result in the selection of all objects in that group. The user may select one or more specific objects, from within such a group, by means of a special command.

At least one family of layer fonts **119** will be stored as electronic files on the computer's storage media **113**, in a directory which the typesetting application **122** will access when generating menus of available fonts. An example of a family of layer fonts is depicted in FIG. **2**.

The layer font manager **126** will, in one embodiment of the invention, be a program directly integrated with the typesetting application **122**. When prompted by user input, the layer font manager **126** will issue commands to the typesetting application **122**. By this means, the layer font manager **126** will manipulate objects and settings within a typesetting application document **124**.

In another embodiment of the present invention, the layer font manager **126** might take the form of a third-party "plug-in," separate from the typesetting application **122**. A plug-in version of the layer font manager **126** would run alongside the typesetting application **122**, interacting with it in much the same way as the fully-integrated embodiment.

A database **310**, stored on the computer's storage media **113**, will contain the names of layer fonts intended for use as multiple-color composite typefaces. The database **310** will record the font names from each family of fonts within a distinct family listing **312**. FIG. **3** illustrates an example of such listings. The layer font manager **126** may replace this database **310** with updated versions, for example by accessing a server connected to the World Wide Web.

Recognition of Layer Fonts

The layer font manager **126** will, while operating, display on the monitor **118** a user interface in the form of a palette **410**, or window, shown in FIG. **4**. The palette **410** will, as detailed throughout this specification, display information about layer fonts applied to text objects selected by the user. The palette **410** will also provide a convenient means for the user to manipulate those objects, in creating and working with composite, multiple-color text.

As depicted in FIG. **5**, each time the user selects a new text object (step **505**), the layer font manager **126** will examine the font applied to that text (step **510**). The layer font manager **126** will then compare the name of the selected font with the font names in the database **310** (step **512**).

If the currently selected font matches a font named in the database **310** ("YES" branch of step **514**), then the layer font manager **126** will retrieve the family listing **312** in which the selected font is named (step **516**). The layer font manager **126** will display the fonts from that family listing **312** in the palette **410** (step **518**). If the currently selected font is not named in the database **310** ("NO" branch of step **514**), then the palette will appear blank.

As depicted in FIG. **4**, the name of the selected object's font will be displayed in the palette **410**, as an active font item **412**, indicated by bold weight type. The other listed fonts will initially be displayed as inactive font items **414**, indicated by regular weight type.

The layer font manager **126** will also display, in the palette **410**, a small, square swatch **416** next to each active font item **412**. The text color of an object will be displayed in the swatch **416** next to that object's font. The layer font manager **126** will not display a swatch **416** next to an inactive font item **414**.

Creating Copies of Text Objects

If the user has selected a line or block of text within a typesetting application document **124**, and the text is set in a layer font named in the database **310**, then the user may create and manage copies of the text through interaction with the palette

410. FIG. 6 depicts the process by which the layer font manager 126 creates copies in response to user input.

To create copies of a selected text object through the layer font manager 126, the user will activate (by double-dicking with the mouse 116) any inactive font item 414 in the palette 410 (step 610). The layer font manager 126 will then compare the relative position, within the palette 410, of the newly-activated font and the font of the already-existing text object (step 616).

If the newly activated font is above the font of the already existing text object, then the layer font manager 126 will generate an exact copy of the existing text object in front of the original (step 618). If the newly activated font is in a lower position, then the layer font manager will generate the copy behind the original text object (step 620).

The layer font manager 126 will apply the newly-activated font to the new copy (step 622). The palette 410 will then display the font of that copy as an active font item 412 (step 624).

Next, the layer font manager 126 will group the original text object and the new copy (step 626). This will ensure that if the topmost copy is moved, all other copies within the composite unit will be moved likewise and, thus, keep all elements of the multiple-color composite text aligned as intended.

The layer font manager 126 will select, from this group, the newly-created copy (step 628). In this way, the layer font manager 126 will automatically provide the user with an opportunity to assign a distinct color value to the additional color variable provided by the newly-activated font.

Finally, the layer font manager 126 will mark the font of the new copy as a selected font item 418 (step 630), by highlighting it in the palette 410. This will assist the user in determining which part or parts of a group are currently selected.

By selecting a group of two or more text objects, as would result from this process, and then activating another inactive font item 414 in the palette 410, the user will cause the layer font manager 126 to generate an additional copy as described above. When a group already exists ("YES" branch of step 612), however, the layer font manager 126 will first ungroup the already-existing objects (step 614), then regroup them along with the new copy (step 626) after it has been added.

FIG. 7A illustrates a group of three text objects, as could be created by the layer font manager 126, in an exploded view; FIG. 7B depicts the composite text seen by the user.

The user may in certain cases deactivate an already active font. As shown in FIG. 8, the user deactivates a font by double-clicking its name, in the palette 410, using the mouse 116 (step 810). The layer font manager 126 will first determine if any other fonts are active (step 812); if only one font is active ("NO" branch of step 812), then the layer font manager 126 will not delete the selected text object. If at least one other font is active ("YES" branch of step 812), however, the layer font manager 126 will then delete the text object assigned the deactivated font (step 814). Any other copy, or copies, which had been grouped with the deleted item will remain unchanged.

Managed Groups

If the user creates a grouped stack of text objects, as described above, and then (after working with other objects in a document, e.g.) selects that group anew, the layer font manager 126 will recognize the group as a managed group. The group of text objects shown in FIG. 7A and FIG. 7B illustrates one example of a managed group.

The layer font manager 126 will, in one embodiment, recognize managed groups by examining certain properties of any object selected in the typesetting application 122. FIG. 9 depicts the steps in this process. After the user has selected a new object (step 910), the layer font manager 126 will determine whether or not the selected object is, or belongs to, a group (step 912). If so, the layer font manager 126 will next compare each of the grouped objects' X/Y coordinates within the document 124 (step 914). If the coordinates match, then the layer font manager 126 will compare the items' text (step 916).

If the text of all objects in the group matches ("YES" branch of step 916), the layer font manager 126 will next compare the font of the first object in the group with the database 310 (step 918). If the font's name is listed in the database 310 ("YES" branch of step 920), the layer font manager 126 will then search within the same family listing 312 for the names of the other fonts present in the group (step 922). If all fonts present in the group are also present in the same family listing 312 ("YES" branch of step 924), then the layer font manager 126 will recognize that group as a managed group (step 926). If any of these tests return a "no," then the layer font manager 126 will determine that the selection is not a managed group (step 928).

In another embodiment, the layer font manager 126 might append a non-visible "tag" to each managed group that it creates within a document 124. In this embodiment, the layer font manager 126 would identify managed groups by checking for and recognizing the tag data, rather than by the method described above.

Managed Group Consistency

To simulate a single, multiple-color text object, the layer font manager 126 will maintain consistent text and typographic settings among the multiple, single-color text objects in a managed group.

In a typical typesetting application, when a user applies a new typographic setting (e.g. point size), all selected text objects will be updated with the new setting. Thus, if a group of text objects is selected, the new setting will automatically apply to all objects in the group. If one specific object is selected from an ordinary group, however, as is necessary to make changes to text or keming, then editing will normally apply only to the selected object, rather than to all of the grouped objects.

If the user selects a specific object from a managed group, however, the layer font manager 126 will apply any text or typographic changes made by the user to all objects in the group, unless the changes are made to font or color. The layer font manager 126 will, likewise, update the size or shape of text boxes in a managed group if the user makes such changes to one item within such a group. FIG. 10 depicts this process.

When a user applies a change (step 1010) to all or part of a managed group, the layer font manager 126 will first determine whether or not the change is the selection of a different font. If the new property is not a font change ("NO" branch of step 1012) and the entire managed group is selected ("YES" branch of step 1013), changes will automatically apply to all objects in the group per normal behavior of a typesetting application.

If only one or some of the copies are selected from the managed group ("NO" branch of step 1013), and the new property is a color change ("YES" branch of step 1016), then the new color will only apply to the selected copy or copies. Changes to any property other than font or color will be applied to all objects in the managed group, selected and unselected (step 1018); this will include text changes, kerning and changes to the size or shape of a text box.

If the user chooses a font from the font menu of the typesetting application 122 while working with a managed group ("YES" branch of step 1012), the layer font manager 126 will

first determine whether or not the new font belongs to the family of fonts already present in the managed group (step **1020**).

If the new font is from a different font family ("YES" branch of step **1020**), the layer font manager **126** will reduce the group to a single object, deleting all but the frontmost selected copy (step **1022**). The remaining text object will be set in the new font.

If the new font is from the same family of fonts already present in the group ("NO" branch of step **1020**), the layer font manager **126** will update the group and the palette (step **1024**); FIG. **11**. depicts this process in further detail.

Same-family Font Changes

If the user selects a font from the font menu of the typesetting application **122** while working with a managed group, and the new font belongs to the family of fonts already present in the group (step **1110**), the group will remain unchanged if the entire group is selected ("YES" branch of step **1112**).

If only part of the managed group is selected ("NO" branch of step **1112**), however, the layer font manager **126** will determine whether or not the newly-selected font is already active somewhere in the group (step **1114**).

If the newly-selected font is already active, and is present in a currently-selected copy ("YES" branch of step **1116**), then all other selected copies, if any, will be deleted (step **1118**). The fonts of any deleted copies will then appear in the palette **410** as inactive (step **1130**).

If, however, the newly-selected font is present in a copy which is not selected ("NO" branch of step **1116**), then the layer font manager **126** will delete all of the selected copies (step **1124**). The fonts of the deleted copies will then appear in the palette **410** as inactive (step **1130**).

If the user has selected a new font from the family of fonts already present in the group, but that specific new font is not currently active anywhere in the group ("NO" branch of step **1114**), then the layer font manager **126** will make the new font active.

If the user has selected only one copy from the managed group ("NO" branch of step **1120**), then the layer font manager **126** will simply apply the newly-selected font to that copy (step **1126**). The palette **410** will then show the selected copy's new font as an active item **412** (step **1128**), and its previous font as an inactive item **414** (step **1130**).

If however the user has selected multiple copies from the managed group ("YES" branch of step **1120**), rather than only one, then the layer font manager **126** will delete all but the frontmost selected copy (step **1122**). The new font will apply to the remaining selected copy (step **1126**), and will appear in the palette as active (step **1128**) while the deleted objects' fonts will appear inactive (step **1130**).

Selections Within a Group

To change the specific color value of a color variable in composite layer font text, the user must first select the appropriate copy of the text, i.e. the copy set in the font whose glyphs comprise that color variable. Because copies of text in a managed group will be stacked directly over one another, it would normally be difficult for the user to select specific items beneath the top of the stack. The layer font manager **126** will permit easier experimentation with color combinations by assisting the user in selecting specific copies from within a group. FIG. **12** depicts this process.

While working with a managed group, the user may select a specific object from that group by selecting a font listed in the palette **410** (step **1210**). If the selected font is active ("YES" branch of step **1212**), then the layer font manager **126** will select from the group the line or block of text which is assigned that font (step **1214**). The user may then easily assign different color values, as well as functions such as transparency or blurring which may be provided by the typesetting application **122**, to the characters of the text without having to break apart the group.

Finally, as noted previously the palette **410** will indicate when one or more specific objects are selected, from within a managed group, by highlighting the font of each selected object as a selected font item **418** (step **1216**).

In another embodiment of the invention the layer font manager **126** might, instead of selecting a text object from within the composite unit, select the text within that object. This embodiment would accommodate typesetting applications, such as Quark XPress™, which require the user to select text itself with a cursor, rather than selecting a text object, in order to apply settings such as text color.

Reordering a Group

As existing layer font families are generally designed for use in a specific order, the database **310** will record each family's fonts per the layering order recommended by their respective designer. In some cases, however, the user may wish to experiment with alternative layer orders (possibly in combination with transparency settings, e.g.) to develop novel graphic effects.

By selecting a specific text object from within a managed group via the palette **410**, as described previously, the user will be able to change its relative place in the group using "bring forward" and "send backward" commands typically provided by a typesetting application **122**.

In one embodiment of the invention, however, the user may also reorder copies in a group simply by manipulating items within the palette **410**. FIG. **13** depicts the steps of this process. In this embodiment, upon selecting one active font item **412** and keeping the mouse button **117** pressed down, the user may drag that font item higher or lower within the palette **410** (step **1310**).

If the user releases an active font item **412** ("YES" branch of step **1312**) at a different point, relative to other active items ("YES" branch of step **1314**), the layer font manager **126** will reorder the text objects within the associated group, to reflect the new item order as depicted in the palette **410** (step **1316**). If the user releases the selected item at a point in the palette **410** such that its position, relative to other active items, has not changed ("NO" branch of step **1314**), then the layer font manager **126** will restore the previous item order (step **1318**) and leave the associated group unchanged.

By either of the methods described above, the user may create a managed group with fonts represented in an order which differs from the default order recorded for their family in the database **310**. In one embodiment of the present invention, the layer font manager **126** will reorganize how items are displayed in the palette **410** if such a reordered managed group is selected. Instead of listing fonts per the default order, the palette **410** will first list all active font items **412** per the order in which they are present in the selected group. Below that, all inactive font items **414** will be listed per the default order.

In another embodiment, the layer font manager **126** might tag each managed group as suggested previously, and link, to the tag of each group that has been reordered, a copy of the relevant font family listing **312**. Within these family listing copies, the layer font manager **126** would record each change made to the order of items in the tagged group. In this embodiment, the user would be able to reorder items in the palette **410** in any way, without regard to items being active or inactive. The palette **410** would then, for any group tagged with a listing copy, display items in the order recorded in that copy.

Text Box Embellishments

In one embodiment of the invention, the layer font manager **126** will include functions to permit composite, multiple-color text with a colored background, border, and/or similar properties.

If a text box with a border is present in a managed group, then the layer font manager **126** will cause the border to apply only to the backmost copy in the group. All other items in a managed group will be borderless. The process of managing border properties is shown in FIG. **14**.

Any time that an object which is not the backmost within a managed group possesses a border ("YES" branch of step **1410**), the layer font manager **126** will assign the border of the frontmost bordered object to the backmost copy within the group (step **1412**). The layer font manager **126** will then remove the border from all other objects in the group (step **1414**).

This process will also apply to text box background colors, corner effects, drop shadows, and other like decorative settings.

Minimalist-Interface Embodiment

Another embodiment of the present invention would replace the palette **410** with a simplified and more compact interface, shown in FIG. **15**A and FIG. **15**B. In this embodiment, the layer font manager **126** would display a simple on-or-off interface, such as a button **1510**, any time that a text object set in a layer font is selected. The layer font manager will recognize layer fonts using the database, as described previously and as illustrated in FIG. **5**.

In FIG. **16** we see a flow diagram, depicting a process of automatically building or deleting groups of stacked text objects set in layer fonts. By clicking on the button **1510** (step **1610**), via the mouse **116**, the user will prompt the layer font manager **126** to create copies of the selected text object (step **1614**). The layer font manager **126** will set each copy in a different font, from the font family of the original object (step **1616**). The layer font manager **126** will, by this means, produce a stack of text objects in which every font from the relevant font family is represented. After creating such a stack of text objects, the layer font manager **126** will group them (step **1618**), creating a managed group as described previously.

In FIG. **15**B we see an expanded interface, to be displayed by the layer font manager **126** while a managed group is selected. The interface will, at these times, display adjacent to the button **1510** a linear series of swatches **1512** (step **1620**). Each swatch will correspond to one text object from the managed group, and will depict the color of the text within the corresponding text object. Swatches will be arranged in the same order as the corresponding objects within the managed group, e.g. the first swatch will represent the frontmost object in the managed group.

By clicking on one or more of the swatches **1512**, the user will be able to select the corresponding individual text object(s) from a managed group, and then assign new color values to the object(s).

This embodiment of the invention will maintain consistent text and typographic settings, and manage decorative properties, within a managed group as described previously. The user will also be able to reorder objects within a managed group by rearranging the corresponding swatches.

This embodiment will not enable activation or deactivation of individual fonts. By assigning a null color **1514** to a text object, however, the user will be able to eliminate that object's glyphs from the visible composite text, though the object will remain part of the group. By clicking the button **1510** while a group is selected ("YES" branch of step **1612**), the user will prompt the layer font manager **126** to delete all of the grouped items but the frontmost selected copy (step **1622**).

Universal Font Management Embodiment

Another embodiment of the invention might omit the database **310**, and instead display the entire family of the currently selected font, for any font. This embodiment would rely on the user's judgment, rather than a master list, in order to determine whether or not a given font family is appropriate for use in composite multiple-color text.

Some typesetting applications examine "family name" data, recorded in font files, in order to group fonts by family in font menus; one such application is Adobe InDesign™, sold by Adobe Systems Inc. of San Jose, Calif. The layer font manager **126** would display fonts in families based on the font menu of such an application. If this embodiment of the invention employed a typesetting application **122** which does not organize font menus by family, the layer font manager **126** itself would examine available fonts, directly, to generate family group listings.

This embodiment of the invention would omit steps **918** and **920** when examining a selected object to recognize a managed group.

Conclusions, Further Ramifications and Scope

The reader will see that at least one embodiment of the present invention provides an efficient, user-friendly system for setting and managing type with multiple color variables in individual characters. It will be further appreciated that this system offers significant practical advantages over existing approaches to multiple-color type.

The embodiments of the invention, disclosed previously, have been presented for the purposes of illustration and description. They are not intended to be exhaustive or to limit the invention to any precise form described. It will be appreciated that various changes, in addition to those expressly stated herein, can be made without departing from the spirit and scope of the invention. For example, in one embodiment, the layer font manager **126** might delete and replace other copies in the managed group after one copy is edited, rather than applying the editing to all existing copies.

Accordingly, the invention is limited only by the following claims and equivalents thereto.

I claim:

1. A desktop publishing system, comprising:

a personal computer;

a typesetting application program;

a plurality of fonts from a layer knit family;

a layer font manager program, being capable of:

presenting in said typesetting application, upon selection of a text object by a user, a user interface, the user interface being in a window;

creating a copy of said text object in alignment with said text object upon said user employing said user interface, the copy being in a second font, the second font being from the font family of the font of said text object;

binding together said text object and said copy of said text object in a composite unit;

wherein the layer font family is a plurality of layer font families, and further including a list of individual ones of said plurality of fonts from said font family of the font of said text object, the list being presented in said window, and by which said user may direct said layer font manager program to create said copy of said text object in a specific font based on a selection from said list by said user; and

wherein said layer font manager program, in response to selection by said user of an individual font within said list when the selected font is already present in said composite

unit, proceeds to select from said composite unit the individual object assigned said selected font.

2. A desktop publishing system, comprising:

a personal computer;

a typesetting application program;

a plurality of fonts from a layer font family;

a layer font manager program, being capable of:

presenting in said typesetting application, upon selection of a text object by a user, a user interface, the user interface being in a window;

creating a copy of said text object in alignment with said text object upon said user employing said user interface, the copy being in a second font, the second font being from the font family of the font of said text object;

binding together said text object and said copy of said text object in a composite unit;

wherein the layer font family is a plurality of layer font families, and further including a list of individual ones of said plurality of fonts from said font family of the font of said text object, the list being presented in said window, and by which said user may direct said layer font manager program to create said copy of said text object in a specific font based on a selection from said list by said user; and

wherein said layer font manager program moves an object within said composite unit, the movement of said object being based upon movement of the respective font of said object, within said list, by said user.

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